Treat Your Building as a Patient: Environmental Reduction of Bacteria Through Continuous Visible Light Disinfection
What is Indigo-Clean™?

• An overhead light fixture which continuously and safely disinfects the environment using *visible* light

*White Disinfection Mode* = Ambient White Light + Disinfection

*Indigo Disinfection Mode* = Increased Disinfection Only
What is Visible Light Disinfection?

Visible light spectrum showing the active element in Indigo-Clean™

405 nanometers: Peak germicidal activity via photoexcitation of porphyrin molecules
Indigo-Clean Safety Summary

Comparison of Indigo-Clean with Daylight

The safe, visible, disinfecting light from Indigo-Clean is similar to daylight.

Safety Testing
Indigo-Clean has been evaluated against existing visible light safety standards.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Testing Method</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>IEC 62471/62778</td>
<td>Independent 3rd Party Laboratory</td>
<td>Pass (Exempt)</td>
</tr>
<tr>
<td>ACGIH&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Self-Assessment</td>
<td>Pass</td>
</tr>
<tr>
<td>ICNIRP&lt;sup&gt;1,3&lt;/sup&gt;</td>
<td>Self-Assessment</td>
<td>Pass</td>
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2: International Electrotechnical Commission – Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires, 2014
3: American Conference of Governmental Industrial Hygienists – Threshold Limit Values (TLVs) & Biological Exposure Indices Signature Publications, Cincinnati, 2007
4: International Commission on Non-Ionizing Radiation Protection – Guidelines on limits of exposure to optical radiation from 0.38 to 3.9 nm. Health Physics 73; 539-555; 1997

Indigo-Clean Source

- D<sub>65</sub> Daylight Spectrum CCT=6500K
- Indigo-Clean
How Does Indigo-Clean Work?

1. Continuous, automatic, safe system creates hostile environment for bacteria

2. Environment creates Reactive Oxygen Species within bacteria causing inactivation

3. Pathogen inactivation breaks the environmental chain of infection

4. Measured bacterial reduction*

Potential Healthcare Applications

- Sterile Processing
- Waiting Areas
- Patient Rooms
- Oncology
- Wound Care Clinics
- Bone Marrow Transplant
- Triage/Trauma
- OR
Why Indigo-Clean in the OR?

- Medically Relevant
- Limited Alternatives
- High Occupancy
- Product Effectiveness
Indigo-Clean In An Operating Room

Airborne Pathogens

Variety of Surfaces

Hard to Reach
Types of Visible Light Disinfection

**Indigo-Only**
- Disinfection only

**Mixed White**
- Use of complimentary colors allows for ambient lighting applications
Clinical Implementation of Indigo-Clean™

- Overhead light fixtures which *continuously* and *safely* disinfect the environment using visible light

**White Disinfection Mode = Ambient White Light + Disinfection**

**Indigo Disinfection Mode = Increased Disinfection Only**

- Wall switch can be used to select desired mode
  - OR
  - Occupancy/Vacancy control can automatically switch between modes
Indigo-Clean Operating Room Solutions

2’x4’ - M4SEDIC24
2’x2’ - M4SEDIC22
1’x4’ - M4SEDIC14
Indigo-Clean Application: Operating Rooms

- Apply standard IES lighting guidelines to determine number of fixtures per room and layout:

  - Current Lighting Layout
    - M2 – 6/32 T8 (10 – 2‘x 4’)
    - M4 – 100W LED (10 – 2‘x 4’)

  - Indigo-Clean™ Lighting Layout
    - M4SEDIC – 100W LED (10 – 2‘x 4’)

  - Average Illuminance:
    - ZONE 1: ~270 fc, ~317 fc, ~360 fc
    - ZONE 2: ~209 fc, ~232 fc, ~263 fc
    - ZONE 3: ~61 fc, ~84 fc, ~96 fc

  - System Power Consumption:
    - 1890W
    - 1150W

  - ~625 sq. ft.
Demonstrated Laboratory Susceptibility to Visible Light Disinfection

**ESKAPE Pathogens**
- Enterococcus faecalis
- Staphylococcal Aureus* (including MRSA)
- Klebsiella pneumoniae
- Acinetobacter baumannii
- Pseudomonas aeruginosa
- Enterobacter species

**Gram-Positive Bacteria**
- Clostridium perfringens
- Staphylococcus epidermidis (CONS)
- Staphylococcus hyicus (CONS)
- Streptococcus pyogenes
- Listeria monocytogenes
- Mycobacterium terrae
- Corynebacterium striatum

**Gram-Negative Bacteria**
- Proteus vulgaris
- Escherichia coli (E. coli)
- Campylobacter jejuni
- Salmonella enteritidis
- Shigella sonnei
- Serratia spp

**Yeast & Filamentous Fungi**
- Aspergillus niger
- Candida albicans
- Saccharomyces cerevisiae

**Bacterial Endospores**
- Clostridium difficile
- Bacillus cereus

*= Demonstrated clinical susceptibility to presumptive S. Aureus & MRSA

Significant reduction of total bacterial contamination on surfaces around the room (2-day use)

76% reduction

All reductions in bacterial contamination were achieved over and above standard cleaning and infection control practices

Froedtert & The Medical College of Wisconsin Froedtert Hospital

• GI Diagnostic Waiting Area
  • Easier to show a reduction due to high amount of bacteria
  • Proximity to procedure rooms
  • Approximately 450 ft.² (Equivalent to small OR)
  • Results consistent with previously published patient room results
  • Additional studies underway
Clinical Results for Indigo-Clean™

• Inactivation of *S. aureus* in Waiting Room

“*In Phase 2 of the trial, where the lighting deployment was optimized across the room, we were able to improve the bacterial reduction to more than 70%.*”

- Dr. Nathan Ledeboer, Associate Professor of Pathology, Medical College of Wisconsin
Clinical **and** Commercial Success!

- State-of-the-art facilities in Las Vegas and other unannounced locations
- Henderson Hospital-Universal Health Services Inc.

“Even the lights will get into the safety prevention with special indigo lighting built into the ceilings that will kill bacteria”

For infection prevention, silver ion-infused countertops will be used in patient care areas to help reduce bacteria; silver ion thread will be used for cubicle curtains; antimicrobial coating will be on all door handles. Even the lights will get into safety prevention with special indigo lighting built into the ceilings that will kill bacteria.

To keep the noise down, there will be high-end, superior acoustics in patient rooms and nursing stations that include areas for group discussions between physicians, case managers and pharmacists. The hospital has also installed special acoustic tile.

It all comes down to patient satisfaction, Kaufmann said.
Thank You!!!

For more information, visit [www.indigo-clean.com](http://www.indigo-clean.com) or [www.kenall.com](http://www.kenall.com)